Image #AF/1616

Attorney Docket No. 9105-2IP

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application of : Fearghus O'Foghludha
Filed: July 11, 2000
Serial No.: 09/614,490

Group Art Unit: 1616
Examiner: Michael G. Hartley

For: **RADIOACTIVE SOURCE MATERIALS FORMABLE INTO VARIOUS SHAPES**

Date: March 30, 2004

Mail Stop Appeal Brief-Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

TRANSMITTAL OF APPEAL BRIEF
(PATENT APPLICATION--37 C.F.R. § 1.192)

1. Transmitted herewith, in triplicate, is the APPEAL BRIEF for the above-identified application, pursuant to the Notice of Appeal filed on January 30, 2004.

2. This application is filed on behalf of
   ☒ a small entity.

3. Pursuant to 37 C.F.R. § 1.17(c), the fee for filing the Appeal Brief is:

☒	small entity	$165.00
☐	other than small entity	$330.00

Appeal Brief fee due $__165.00_____

☒ Any additional fee or refund may be charged to Deposit Account 50-0220.

Respectfully submitted,

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Carey Gregory

Carey Gregory

Attorney's Docket No.: 9105-2IP PATENT

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APPELLANT'S BRIEF ON APPEAL UNDER 37 C.F.R. § 1.192

Sir:

This Appeal Brief is filed in triplicate pursuant to the "Notice of Appeal to the Board of Patent Appeals and Interferences" filed on January 30, 2004.

REAL PARTY IN INTEREST

The real party in interest is Civatech Corporation of Raleigh, North Carolina, the assignee of this application by virtue of an assignment from the inventors recorded in Reel/Frame No. 011/0726.

RELATED APPEALS AND INTERFERENCES

None.

STATUS OF CLAIMS

Claims 1 and 3-19 are pending in the present application as of the filing date of this Brief, and Claims 10-19 have been withdrawn from consideration. As of the filing date of this Brief, Claims 1, 4 and 6-9 stand rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 5,163,896 to Suthanthiran ("Suthanthiran"), Claims 1, 3, 4 and 6-9 stand rejected under 35 U.S.C. § 102(e) as being anticipated by U.S. Patent Application Publication No. 2002/0054851 to Grunze ("Grunze"), and Claims 1 and 3-9 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over either one of Suthanthiran or Grunze in view of

either one of U.S. Patent No. 6,152,869 to Park ("Park") or U.S. Patent No. 5,342,283 to Good ("Good"). Appellant appeals the final rejection of Claims 1 and 3-9.

STATUS OF AMENDMENTS

Three Amendments have been filed in this application. An Amendment was filed on October 22, 2002 followed by an Amendment After Final filed on February 12, 2003. The Amendment After Final was entered after a Request for Continued Examination was filed on April 14, 2003. A subsequent Amendment was filed on May 30, 2003.

SUMMARY OF THE INVENTION

The present invention provides an integral source material having at least one nuclide that is activated by exposure to radiation. The nuclide is a chemically bound constituent of the backbone of a polymer of the integral source material, which can be configured before activation to provide a device.

Because the nuclide is a chemically bound constituent of the backbone of the polymer and the nuclide is activated after formation of the desired device, industrial and/or medical devices of various shapes can be fabricated while the target material is still inert and without radiation hazard. Moreover, molds or tools used in forming are not contaminated by radiation. Examples of devices that can be made according to embodiments of the present invention include test-objects, rectangular and disc shaped sources configured to radiate an area, radioactive enclosures, flood sources, nuclear imaging devices, shrouds and excitation sources for energy-dispersive fluorescence analysis.

According to embodiments of the invention, spatial variations of the radioactivity in the final activated product may be reduced. The concentration of the target nuclide in the backbone of the polymer and the resulting radioactivity post-activation can be nearly uniform. Some spatial variation in the radioactivity may remain due to non-uniform distribution of the activating flux before it strikes the irradiated object and subsequent absorption of the flux as it penetrates the target. However, any non-uniformities can be minimized by assembling a large area from an array of smaller and similarly activated pieces. *See* Specification, page 4, lines 15-22.

ISSUES

1. Are Claims 1, 4 and 6-9 properly rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 5,163,896 to Suthanthiran ("Suthanthiran")?

2. Are Claims 1, 3, 4, and 6-9 properly rejected under 35 U.S.C. § 102(e) as being anticipated by U.S. Patent Application Publication No. 2002/0054851 to Grunze ("Grunze")?

3. Are Claims 1 and 3-9 properly rejected under 35 U.S.C. § 103(a) as being unpatentable over either one of Suthanthiran or Grunze in view of U.S. Patent No. 6,152,869 to Park ("Park")?

4. Are Claims 1 and 3-9 properly rejected under 35 U.S.C. § 103(a) as being unpatentable over either one of Suthanthiran or Grunze in view of U.S. Patent No. 5,342,283 to Good ("Good")?

GROUPING OF CLAIMS

For appeal, the claims may be grouped together as follows:

Group I: Claims 1, 4 and 6-9 stand or fall together.

Group II: Claim 3.

Group III: Claim 5.

ARGUMENT

I. The Anticipation Rejections under 35 U.S.C. §§ 102(b) and 102(e) Should Be Withdrawn

A. Introduction

Appellant respectfully traverses the rejection and submits that the cited references do not disclose all of the recitations of the claims as required in a rejection under 35 U.S.C. § 102. In particular, anticipation under § 102 requires that each and every element of the claim be found in a single prior art reference. *W. L. Gore & Associates Inc. v. Garlock, Inc.* , 721 F.2d 1540, 1554, 220 U.S.P.Q. 303, 313 (Fed. Cir. 1983). That is, all material elements of a claim must be found in one prior art source. *In re Marshall*, 198 U.S.P.Q. 344 (C.C.P.A 1978). "Anticipation under 35 U.S.C. § 102 requires the disclosure in a single piece of prior art of each and every limitation of a claimed invention." *Apple Computer Inc. v. Articulate Systems Inc.* 57 USPQ2d 1057, 1061 (Fed. Cir. 2000). A finding of anticipation further requires that there must be no difference between the claimed invention and the disclosure of the cited reference as viewed by one of ordinary skill in the art. *See Scripps Clinic & Research Foundation v. Genentech Inc.*, 927 F.2d 1565, 1576, 18 U.S.P.Q.2d 1001, 1010 (Fed. Cir. 1991).

Claim 1, as amended, recites (emphasis added):

> An integral source material having at least one nuclide that is activated by exposure to radiation, the nuclide is a chemically bound constituent of the backbone of a polymer of the integral source material, wherein the integral source material is configured before activation to provide a device wherein the device is selected from the group consisting of test-objects, rectangular and disc shaped sources configured to radiate an area, radioactive enclosures, flood sources, nuclear imaging devices, shrouds and excitation sources for energy-dispersive fluorescence analysis.

As discussed below, Suthanthiran and Grunze do not disclose at least the underlined features and elements of Claim 1 above as required under § 102.

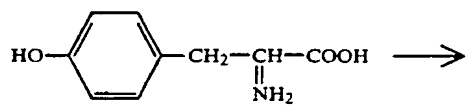
B. Claims 1, 4 and 6-9 (Group I) are Not Anticipated and Patentable Over Suthanthiran under 35 U.S.C. § 102(b).

The Office Action mailed October 31, 2003 (the "10/31/03 Action") takes the position that Suthanthiran discloses polymers in which the nuclide is part of the backbone of the polymer:

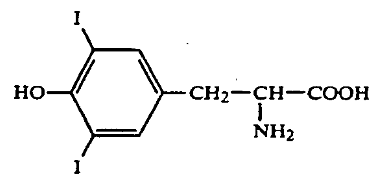
...Suthanthiran discloses that the source can comprise P-32

> polynucleotides, which are clearly a polymer having the nuclide as a constituent of the polymer backbone, as the P atom of a polynucleotide is in the chain or backbone of the polymer.

Polymer Chemistry: An Introduction Raymond B. Seymour and Charles E. Carraher, Jr., page 43 (3rd Edition; 1992), defines a "backbone" as "the principal chain in a polymer molecule." In contrast, Suthanthiran clearly shows the radioactive nuclide as part of a pendant group. The polymer of Suthanthiran is reproduced below, in which ^{125}I is illustrated as part of a pendant group and not as a chemically bound constituent of the backbone of the polymer as recited in Claim 1.



Tyrosine



3,4-diiodotyrosine

Suthanthiran discusses that "radioisotopes other than ^{125}I may be used ....[o]ther radioisotopes such as ^{32}P can also be incorporated into polynucleotides (polyamino acids)." *See* col. 4, lines 4-5. However, as illustrated above, Suthanthiran illustrates polyamino acids in which ^{125}I is labeled at the 3' and 4' positions of the aromatic ring of the tyrosine molecules of the polypeptide chain. *See* col. 3, lines 19-24. Nothing in Suthanthiran teaches or suggests that ^{32}P would occupy a different position in a polyamino acid. As discussed above, this position is clearly a pendant group off the polymer chain and is not a chemically bound constituent of the backbone of a polymer.

Moreover, Suthanthiran does not teach or suggest a nuclide that is activated by exposure to radiation nor does it teach an integral source material that is configured before activation to provide a device as recited in Claim 1. The 10/31/02 Action states that "in product-by-process claims, determination of patentability is based on the product itself...The

fact that the nuclide was made by a process of being 'activated by exposure to radiation' would not give rise to a product which is different from Suthanthiran..." However, as discussed above, Suthanthiran discussed nuclides that are a pendant group and does not teach or suggest an activated nuclide that is a chemically bound constituent of the backbone of the polymer chain as recited in Claim 1. Therefore, the structure of Suthanthiran is different from the claimed invention, and the present invention is not anticipated by Suthanthiran.

C. Claims 1, 3, 4, and 6-9 (Groups I and II) are Not Anticipated and Patentable Over Grunze under 35 U.S.C. § 102(e).

Claims 1, 3, 4 and 6-9 (Groups I and II) stand rejected over Grunze under § 102(e). The 10/31/04 Action takes the position that "Gruze discloses an integral source, *i.e.*, an artificial implant, comprising a nuclide that is a constituent of the polymer chain..." The 10/31/04 Action further states that "the recitation of 'activated by' cannot be used to differentiate over the cited art, as this is clearly a product-by-process limitation."

Claim 1 recites that "the integral source material is configured before activation to provide a device." Grunze proposes polymer coatings that are formed using a previously activated isotope using "hot chemistry" methods. Appellant submits that the polymer coatings in Grunze have different physical characteristics than polymers used to form devices according to the present invention.

Grunze proposes radioactively labeled polymers that are prepared using radioactive isotopes. For example, Grunze discusses condensing ^{32}P-labeled phosphorus pentachloride, which is radioactive, with ammonium chloride. *See* paragraph 37. The resulting radiolabeled hexachlorocyclotriphosphazene is polymerized, resulting in radiolabeled polydichlorophosphazene, which is then esterified. *See* paragraph 38. Accordingly, Grunze describes "hot chemistry" methods, which use radioactive isotopes during a manufacturing process. The radiolabeled antithrombogenic polymer in Grunze is applied as a coating on the surface of a substrate. *See* paragraph 24. The coating can have a thickness of about 1 nm up to about about 1 μm. *See* paragraph 25. According to Grunze, these "hot chemistry" methods form a polymer including a radiolabeled component, such as ^{32}P, that can be randomly distributed. *See* paragraph 13. Grunze discusses that the quantity of the radioisotope used in

forming the polymer depends on the desired radioactivity. *See* paragraph 37. In some embodiments, every phosphorus in the polyphosphazene backbone can be a radioactivated isotope. *See* paragraph 13.

In contrast to the nanometer or micrometer polymer coating proposed in Grunze, the polymer of the present invention can be configured to provide a device, such as test objects, rectangular and disc shaped sources, radioactive enclosures, etc. That is, polymers according to the present invention can be formed into a device rather than merely being used as a coating over a device as discussed in Grunze. For example, as discussed on page 8, lines 15-20, a polymer according to the present invention can be formed into an annular ring that has dimensions of the order of 0.5 to 1 inch interior diameter, 0.75 to 1.25 inch outer diameter, and a thickness of 0.1 to 0.3 inches. *See* paragraph 61. Although Grunze proposes that its antithrombogenic polymer can be used "as the complete material in particular applications, such as in their use as endovascular prostheses and the like", the examples in Grunze propose coatings that are on the nanometer or micrometer scale. The thickest coatings discussed by Grunze are coatings that are "about 1 nm to about 100 μm." *See* paragraph 25.

In addition, in contrast to the random distribution of isotopes discussed in Grunze, the present invention may reduce variations in the radioactivity because the nuclide is a chemically bound constituent of the backbone of the polymer and is activated after formation of the desired device. Accordingly, the concentration of the target nuclide in the backbone of the polymer and the resulting radioactivity post-activation can be nearly uniform.

Accordingly, Grunze does not teach or suggest a nuclide that is activated by exposure to radiation or an integral source material that is configured before activation to provide a device as recited in Claim 1. For at least the foregoing reasons, Appellant respectfully submits that the rejection of the pending claims under 35 U.S.C. § 102 is improper and respectfully requests that this rejection be withdrawn.

II. The Obviousness Rejections under 35 U.S.C. § 103(a) Should Be Withdrawn

A. Introduction

To establish a *prima facie* case of obviousness under 35 U.S.C. §103(a), the prior art

reference or references when combined must teach or suggest *all* the recitations of the claim, and there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. There must also be a reasonable expectation of success of the combination. M.P.E.P. § 2143. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found *in the prior art*, not in applicant's disclosure. See MPEP § 2143. The mere fact that references can be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination. M.P.E.P. § 2143.01, citing *In re Mills*, 16 U.S.P.Q.2d 1430 (Fed. Cir. 1990). As stated by the Court of Appeals for the Federal Circuit, to support combining references, evidence of a suggestion, teaching, or motivation to combine must be clear and particular, and this requirement for clear and particular evidence is not met by broad and conclusory statements about the teachings of references. *In re Dembiczak*, 50 U.S.P.Q.2d 1614, 1617 (Fed. Cir. 1999). The Court of Appeals for the Federal Circuit has also stated that, to support combining or modifying references, there must be particular evidence from the prior art as to the reason the skilled artisan, with no knowledge of the claimed invention, would have selected these components for combination in the manner claimed. *In re Kotzab*, 55 U.S.P.Q.2d 1313, 1317 (Fed. Cir. 2000).

Moreover, the Federal Circuit has noted that, "[i]t is insufficient to establish obviousness that the separate elements of the invention existed in the prior art, absent some teaching or suggestion, in the prior art to combine the elements." *Arkie Lures Inc. v. Gene Larew Tackle, Inc.*, 43 U.S.P.Q.2d 1294, 1297 (Fed. Cir. 1997). Further, the mere fact that known principles are employed cannot render the invention obvious; most inventions employ known principles. *Lindemann Maschinenfabrik v. American Hoist & Derrick Co.*, 221 U.S.P.Q. 481, 489 (Fed. Cir. 1984). The standard of obviousness is not whether, in hindsight, someone would have combined elements to form the invention. *W.L. Gore & Associates v. Garlock, Inc.*, 220 U.S.P.Q. 303, 312-313 (Fed. Cir. 1983).

B. Claims 1 and 3-9 (Groups I, II and III) are Non-obvious and Patentable Over Either One of Suthanthiran or Grunze in view of Park or Good under 35 U.S.C. § 103(a).

1. Groups I and II

As discussed above, neither Suthanthiran nor Grunze teach a nuclide that is a chemically bound constituent of the backbone of a polymer of the integral source material and an integral source material that is configured before activation to provide a device. The deficiencies in Suthanthiran and Grunze are not remedied by Park or Good. In addition, Appellants submit that there is also no clear and particular motivation or teaching to combine the teachings of either Suthanthiran or Grunze with Park or Good.

The 10/31/03 Action states that Claims 1 and 3-9 have been rejected for the reasons set forth in the Office Action mailed May 30, 2003 ("the 5/30/03 Action"). With respect to the rejections under 35 U.S.C. § 103(a), the 5/30/03 Action states that Park discloses that the nuclide can be one that is activatable by irradiation and that "[i]t would have been obvious to one of ordinary skill in the art to use a nuclide which is activatable in the radioactive polymer based radioactive source disclosed by Suthanthiran or Grunze because it is well known in the art that the use of a radioactivatable nuclide (*e.g.*, a radionuclide precursor) may be used in a radioactive source as equivalent to radionuclides for easier and safer preparation." The 10/31/04 Action further states as follows:

> The advantage disclosed by Park and Good is using a stable nuclide, which may later be irradiated to provide a radionuclide. This advantage would not be dependent on the position of the nuclide, for example, whether or not it was in the backbone or eleshere in the radioactive source. Obviousness does not require absolute predictability. The predictability of irradiating a nuclide to form a radionuclide would be predictable to gain the advantage of Park and Good regardless of the position of the nuclide, as Park and Good do not suggest that the position of the nuclide is critical in irradiation. Further, these claims do not require the actual steps that the source be formed and then irradiated. The only requirement is that a nuclide be activated. Park and Good clearly teach that nuclides which are activated into radionuclides may be used for such radioactive sources, such as, those disclosed by Suthanthiran or Grunze.

Appellant respectfully disagrees with the reasoning in both the 5/30/03 Action and the 10/31/04 Action. The conclusory statements in the 10/31/03 Action that the "advantage [of

Park or Good] would not be dependent on the position of the backbone" and that the combination "would be predictable to gain the advantage of Park and Good regardless of the position of the nuclide" are impermissible hindsight.

Suthanthiran and Grunze do not discuss any need for post-configuration irradiation of the proposed polymers. Park and Good do not teach or suggest that post-configuration irradiation could be used on a radionuclide that is a chemically bound constituent of the backbone of a polymer. Therefore, the cited references do not provide motivation for the combination or a reasonable expectation of success. In particular, Park and Good merely discuss the activation of elemental or compound radionuclides and do not teach or suggest that radionuclides that are chemically bound constituents of a polymer may be activated by exposure to radiation.

Park proposes a radionuclide that is evenly mixed with a carrier material and dried to be dispersed and fixed within the carrier polymer. See col. 6, lines 24-29. That is, the carrier material is dispersed or mechanically incorporated within the carrier polymer. Park then discusses a "post-irradiation method." According to Park, a sleeve which contains stable isotopes can be adhered onto a non-radioactive stent and then irradiated with neutrons in a nuclear reactor. See col. 6, lines 30-50.

Good discusses elemental radioisotopes and does not discuss radionuclides in polymers at all. Good merely states generally "[i]t is a still further object of the invention to provide a novel method for incorporation of a nonradioactive elemental isotope into a seed during manufacture of a seed that will later form the desired radioactive isotope when the finished seed is bombarded with neutrons." Good proposes radiation emitting materials as follows:

> The radiation emitting layer 16 may be a radiation emitting compound layer (such as thallium selenide-72, antimony telluride-119, uranium boride-231, zirconium carbide-86, copper iodide-125, Mo carbide-99, tantalum carbide-177, vanadium carbide-48, gallium telluride-67, indium telluride-125m, titanium iodide-125, or copper indium selenium-75) laminated with a hard metal (tantalum, tungsten, titanium, hafnium, zirconium, diamond-like carbon, niobium, osmium), metal compound (titanium nitride, titanium carbonitride, zirconium nitride, zirconium carbide, tantalum carbide, tungsten carbide, boron carbide, chromium

> dicarbide, hafnium carbide, hafnium oxide, lanthanum oxide, thorium carbide, vanadium carbide, hafnium nitride), or nonmetal (diamond or carbon) diffusion barrier. This laminated radiation-emitting coat uniformly covers the solid microspherical metal or carbon core (substrate).

As can be seen in the lengthy list of proposed radiation emitting materials, no polymers are mentioned.

In summary, both Park and Good propose radionuclides that are not chemically bound constituents of the backbone of a polymer. The radionuclides in Park are fixed within a carrier polymer and the radiation emitting materials in Good are elemental isotopes and compounds. Nothing in the cited references suggests that post-irradiation techniques would be desirable or successful to irradiate a nuclide that is a chemically bound constituent of a polymer.

Appellant respectfully submits that the rejection of the pending claims under 35 U.S.C. § 103(a) is improper and respectfully requests that this rejection be withdrawn.

2. Group III

Claim 5 recites that "the device comprises a checkerboard comprising alternating active and inactive squares, the active squares containing the integral source material." The Action states that Park "teaches that the stents may be in a checkerboard, see figures 2 and 3."

As discussed above, Park discusses radionuclides that are fixed in a carrier material. Figures 2 and 3 merely illustrate radioactive nuclides **2** that are fixed in a polyurethane carrier **3**. *See, e.g.*, column 5, lines 5-11 and column 6, lines 23-26 ("The radionuclide (**2**) is evenly mixed with the above carrier material evenly and dried to be dispersed and fixed within the carrier polymer (**3**)."). Appellants submit that nothing in Park, Suthanthiran or Grunze teaches or suggests a device comprising a checkerboard.

CONCLUSION

On the entire record and in view of all the cited references, Appellants submit that Claims 1 and 3-9 are novel and non-obvious. Accordingly, it is respectfully requested that the Examiner's conclusions be reversed, and that this case be passed to issuance.

Respectfully requested,

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Carey Gregory
200775

CLAIMS APPENDIX

What is Claimed is:

1. An integral source material having at least one nuclide that is activated by exposure to radiation, the nuclide is a chemically bound constituent of the backbone of a polymer of the integral source material, wherein the integral source material is configured before activation to provide a device wherein the device is selected from the group consisting of test-objects, rectangular and disc shaped sources configured to radiate an area, radioactive enclosures, flood sources, nuclear imaging devices, shrouds and excitation sources for energy-dispersive fluorescence analysis.

2. (Canceled).

3. The integral source material according to Claim 1, wherein the polymer is selected from the group consisting of polypropylene, polyethylene terephthalate, nylon, acrylates, polyurethane, polyphenylene oxide blends, polyphenylsulfone, polysulfone, polyether sulfone, polyphenylene sulfide, phenyletheretherketone, polyetherimide, polyphenylmetallosiloxane, fluorine containing polyphosphazenes and liquid crystal polymer and blends and combinations thereof.

4. The integral source material according to Claim 1, wherein the nuclide is selected from the group consisting of one or more of Li, Na, C, Al, P, S, Ca, Ti, V, Cr, Mn, Fe, Co, Ni, Cu, Zn, Ge, Sr, Y, Zr, Mo, Tc, Rh, Pd, Cs, Ba, La, Ce, Eu, Gd, Re, Ir, Au, Hg, Pb, Bi, Po and Am.

5. An integral source material according to Claim 1, wherein the device comprises a checkerboard comprising alternating active and inactive squares, the active squares containing the integral source material.

6. An integral source material according to Claim 1, wherein the device comprises a rectangular substrate for irradiating an area.

7. An integral source material according to Claim 1, wherein the device comprises a tube enclosure having radioactive walls.

8. An integral source material according to Claim 7, wherein the tube enclosure comprises a flexible material.

9. An integral source material according to Claim 7, wherein the tube enclosure comprises a rigid material.

10. A method of forming an integral source material comprising:

providing an integral source material comprising a polymer chain having at least one non-radioactive nuclide that is activatable by exposure to radiation and is a chemically bound constituent of the backbone of the polymer of the integral source material;

forming the integral source material into a device, wherein the device is selected from the group consisting of test-objects, rectangular and disc shaped sources configured to radiate an area, radioactive enclosures, flood sources, nuclear imaging devices, shrouds and excitation sources for energy-dispersive fluorescence analysis; and

exposing the integral source material to radiation to activate the at least one nuclide of the polymer chain.

11. The method of Claim 10, wherein exposing the integral source material to radiation comprises exposing the integral source material to neutrons.

12. The method of Claim 10, wherein the polymer is selected from the group consisting of polypropylene, polyethylene terephthalate, nylon, acrylates, polyurethane, polyphenylene oxide blends, polyphenylsulfone, polysulfone, polyether sulfone, polyphenylene sulfide, phenyletheretherketone, polyetherimide, polyphenylmetallosiloxane,

fluorine containing polyphosphazenes and liquid crystal polymer and blends and combinations thereof.

13. The method of Claim 10, wherein the nuclide is selected from the group consisting of one or more of Li, Na, Al, P, S, Ca, Ti, V, Cr, Mn, Fe, Co, Ni, Cu, Zn, Ge, Sr, Y, Zr, Mo, Tc, Rh, Pd, Cs, Ba, La, Ce, Eu, Gd, Re, Ir, Au, Hg, Pb, Bi, Po and Am.

14. The method of Claim 10, wherein the device comprises a checkerboard comprising alternating active and inactive squares, the active squares containing the integral source material.

15. The method of Claim 10, wherein the device comprises a rectangular substrate for irradiating an area.

16. The method of Claim 10, wherein the device comprises a tube enclosure having radioactive walls.

17. The method of Claim 16, wherein the tube enclosure comprises a flexible material.

18. The method of Claim 17, wherein the tube enclosure comprises a rigid material.

19. The integral source material according to Claim 1, wherein the polymer further comprises a side chain comprising a second nuclide consisting of I, F or Cl.